Public Report for ESA-250-2
Final

Company	Quality Ingredients Corporation	**ESA Dates**	December 3 - 5, 2007
Plant	Marshfield, WI	**ESA Type**	Steam System ESA
Product	Dried Food Products	**ESA Specialist**	Ven V. Venkatesan

Brief Narrative Summary Report for the Energy Savings Assessment:

Introduction:
The Quality Ingredients Corporation (QIC)'s Marshfield plant produces dried food products. This plant generates steam @120-psig pressure and utilizes it at 120-psig & 15-psig pressure levels. Steam is generated by a single Cleaver Books water tube boiler (1979 make), located in a separate building next to the process area. Steam is used in the dryer, the hot water tanks, CIP (Cleaning-In-Place) skids, and for Space heating applications at this site. A small quantity of steam is also injected into the process before Pasteurization in the Intake area. About 30% of the condensate is returned back to the boiler house.

The QIC, Marshfield site purchases Natural gas & Electricity from the local utility companies for its energy needs. About 65% of the purchased natural gas is used in the boilers and the balance natural gas is fired in the dryer to supply the hot air. Since the boiler consumes the larger share of the purchased natural gas the ESA is focused on its Steam system.

Objective of ESA:
To provide U.S. industries technical assistance targeted to reduce their fuel expenditure.

Focus of Assessment:
The focus of this Steam System Energy Savings Assessment (ESA) is as follows: (1) to train in-plant personnel to continue and sustain the improvements and (2) to identify energy waste reduction opportunities. This ESA is focused on the Steam System at Quality Ingredients Corporation's Marshfield plant covering its Boiler, Dryer, Intake section, and Warehouse area.

Approach for ESA:
USDOE qualified specialist provided training to the plant engineers in the use of USDOE's SSST & SSAT tools and helped them in completing an initial assessment using the SSAT model developed for the QIC's Marshfield site.

General Observations of Potential Opportunities:
The QIC, Marshfield site consumed 96,826 MMBtu of purchased natural gas during the year 2006. This site also consumed 5,055,530 kWhs of electricity during the year 2006. However during the past 12 months (Dec 2006 to Nov 2007), the impact energy costs have declined marginally. The recent impact costs were used at the SSAT model during the ESA.

The following Energy Saving Opportunities were identified during the ESA and based on their preliminary evaluation, they are classified as Near/Medium/Long term opportunities;

- Near term opportunities would include actions that could be taken as improvements in operating practices, maintenance of equipment or relatively low cost actions or equipment purchases.
- Medium term opportunities would require purchase of additional equipment and/or changes in the system such as addition of recuperative air preheaters and use of energy to substitute current practices of steam use etc. It would be necessary to carryout further engineering and return-on-investment analysis.
- Long term opportunities would require testing of new technology and confirmation of performance of these technologies under the plant operating conditions with economic justification to meet the corporate investment criteria.

1. Improve boiler efficiency by optimizing the excess air supply to the boiler burner
   The flue gas measurement at the boiler stack indicates that the boiler's burner is burning fuel with 59% excess air at mid-fire conditions. Since the typical optimum excess air levels for natural gas burners are around 10% -

20%, the excess air supply to this burner needs to be trimmed down to about 20 - 25%. To accomplish and sustain the optimum excess air levels, it is recommended that the operator be sent to an Efficient Boiler Operation course and to procure a portable flue gas analyzer.
Estimated benefit due to optimum excess air operation of the boiler would be $8,600 annually. (Near Term)

2. Decrease the boiler blowdown rate
At present, the feed water cycle at the boiler drum is maintained at around 8.8 cycles. The blowdown rate corresponding to 8.8 cycles is around 11.4%. By carefully monitoring the feed water analysis, the boiler drum water conductivity/TDS could be increased to reach about 10 cycles. This would reduce the boiler blowdown rate to around 10% from the present levels of 11.4%.
Estimated benefit due to decreasing the boiler blowdown rate would be $3,000 annually. (Near Term)

3. Increase condensate recovery:
At present, only about 30% of the total steam generated at the boilers is estimated as being returned back as condensate from the various steam users. The reason the condensate is not being returned is because of either suspected contamination or that too many steam spargers are put in service for heating the water. At a typical plant the size of QIC's Marshfield plant, about 60 – 65% of the generated steam could be returned back to the boiler house. Installation of an on-line conductivity sensor in the condensate line would identify the contaminated condensate, if any heat exchangers started leaking.
Estimated benefit due to increased condensate recovery would be $32,400 annually. (Medium Term)

4. Implement Steam Trap Maintenance Program:
The QIC's Marshfield site has about 57 steam traps installed at various locations of the steam system. However, steam trap surveys were not conducted in the past 10 years. Since most of the steam traps are directly connected to the condensate return header, their failed condition may go undetected for long periods of time. In order to reduce the steam losses and to maintain the "best in class" status, QIC should initiate an annual trap survey & replacement program.
A well-maintained steam trap population at its Marshfield site, QIC would save $19,200 annually.
(Medium Term)

5. Implement Steam Leak Maintenance Program
The housekeeping levels at QIC, Marshfield are very good, resulting in only few visible steam leaks. Continuing with the steam leak maintenance program could move QIC towards achieving excellence in Industrial housekeeping practices.
Estimated benefit due to maintaining fewer number of steam leaks would be $1,200 annually. (Near Term)

6. Improve Insulation:
The pipeline insulation levels at QIC, Marshfield is very good resulting in only few visible un-insulated sections of steam & condensate pipelines. Insulating the few bare surface sections of the steam & condensate piping could move QIC towards achieving excellence in steam system insulation practices.
Estimated benefit due to insulating all bare steam & condensate pipes would be $1,000 annually. (Near Term)

7. Lower the steam generation pressure at the Boiler by 5 – 10psi:
At present, the steam generation pressure at the boiler house is set at 115-psig instead of the typical 120-psig pressure maintained in the past. As there are no operating problems experienced at the process areas, the steam generation pressure at the boiler could be reduced to about 110-psig.
Estimated benefit due to reducing the Boiler set pressure to 110-psig would be $3,000 annually. (Near Term)

8. Install a new suitably-sized Boiler replacing the existing large boiler operating at lower efficiency:
Presently, the boiler is operated at only about 35% of its capacity. Also, its control system is older and not suitable to maintain efficient combustion conditions. Hence it is recommended that this boiler be replaced with a newer, more efficient & suitably-sized boiler.
Estimated benefit due to operating a new smaller & efficient Boiler would be $54,600 annually. (Long Term)

In addition to the above 8 energy saving opportunities, QIC management may consider the following 2 opportunities also to save energy.

A. Supply 15-psig steam to the few space heaters that are presently supplied with 120-psig steam
B. Install a Heat Pipe at the air ducts where Dehumidifying & Reheat coils are installed.

This ESA is only a preliminary assessment, and a more detailed review, engineering and economic analysis is required prior to implementing the above opportunities.

Management Support and Comments:
QIC is a small, but well-established Dried Food product manufacturing company, with manufacturing units located in Wisconsin & Minneapolis, USA. The QIC management team has shown great enthusiasm by already implementing a major heat recovery project in their largest energy consumer at this site. The plant personnel took interest by participating in the ESA & in the wrap-up presentation. The Plant Management team evinced interest to pursue further with the ESA recommendations and to look for additional energy savings opportunities not covered by the SSAT model as well. The **Focus on Energy** group at Wisconsin is also supporting QIC's efforts to save energy at its site.

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